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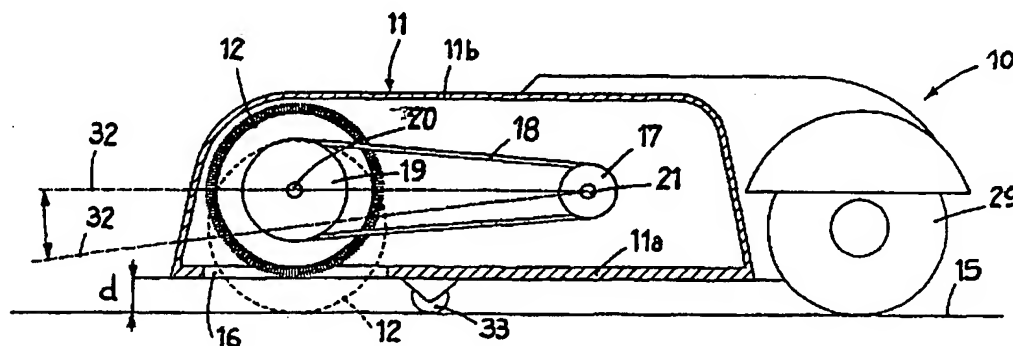
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ning of each regular issue of the PCT Gazette.

(54) Title: CLEANING DEVICE WITH ADJUSTABLE BRUSH



(57) Abstract: Cleaning device comprising a containing structure (11) provided with sliding means (29, 33) by means of which it is able to be moved on a surface to be cleaned (15) and with at least a rotary brush (12), wherein said sliding means (29, 33) are able to maintain the box-like structure (11) at a defined distance (d) from the surface to be cleaned (15) and wherein there are adjustment

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## CLEANING DEVICE WITH ADJUSTABLE BRUSH

\* \* \* \* \*

## FIELD OF THE INVENTION

5 The invention concerns a cleaning device equipped with at least a brush with a horizontal axis of rotation which, in cooperation with suction means, is able to remove dust and dirt from any surface whatsoever and in particular from a surface consisting of a fabric such as, for example, a carpet or moquette.

10 In the cleaning device according to the invention, the distance of the rotary brush from the surface to be cleaned can be adjusted by the user to allow him/her to adapt the device to the specific surface to be cleaned or the type of dirt to be removed.

## 15 BACKGROUND OF THE INVENTION

The state of the art includes cleaning devices, commonly known as carpet cleaners, equipped with a lower box-like structure provided at the upper part with a steering handle and at the lower part with a brush with a substantially  
20 horizontal axis of rotation.

In cooperation with conventional type suction means, the brush is able to remove the dust and dirt from any surface whatsoever and, in particular, from a fabric such as a carpet or moquette.

25 In conventional devices, the box-like structure is usually equipped with wheels and the rotary brush is mounted in a nominal position, fixed with respect to said box-like structure.

30 The brush can have at most small oscillations with respect to the nominal position, thanks to an elastic shock absorber located between its rotation shaft and the box-like structure.

In this type of cleaning device, therefore, to adjust the position of the rotary brush with respect to the surface to be cleaned, in order to adapt it to the latter, the user acts on suitable adjustment means able to vary the position  
5 of the wheels and, consequently, the distance between the lower surface of the box-like structure and the surface to be cleaned.

However, this type of adjustment makes the suction of the suction system less effective, mainly due to the fact that,  
10 by raising the box-like structure from the surface to be cleaned, there is inevitably an increase in the volume defined between the surface to be cleaned and the lower surface of the box-like structure, where said suction action has to be exerted.

15 The present Applicant has devised and embodied this invention to overcome this shortcoming which users particularly complain of, and to obtain other advantages as shown hereafter.

#### SUMMARY OF THE INVENTION

20 The invention is set forth and characterized in the main claim, while the dependent claims describe other innovative characteristics of the invention.

The main purpose of the invention is to achieve a cleaning device equipped with at least a brush with a horizontal axis  
25 of rotation, which can be adjusted with respect to the surface to be cleaned without compromising the effectiveness of the suction means.

Another purpose of the invention is to provide a cleaning device wherein the adjustment of said rotary brush is  
30 extremely simple, quick and precise.

A further purpose of the invention is to allow micro-adjustments of the position of the rotary brush so as to be able to use it until its bristles are completely worn.

A cleaning device according to the invention comprises, like conventional cleaning devices, a lower box-like structure able to be moved, by steering means commanded by the user, on any surface to be cleaned and able to contain  
5 at least a brush equipped with a rotation shaft with a horizontal axis driven by a motor.

According to one characteristic of the invention, sliding means are able to maintain the box-like structure at a set distance from the surface to be cleaned and adjustment  
10 means, able to be driven by the user, are provided to vary the position of the rotary brush with respect to the box-like structure and, consequently, the distance of the rotary brush from the surface to be cleaned.

In the preferential embodiment of the invention, the  
15 adjustment means are able to selectively move the brush upwards or downwards with a movement of revolution around a particular axis of the box-like structure.

According to one embodiment, said axis coincides with the axis of rotation of the shaft of the motor which makes the  
20 brush rotate and which is connected to the shaft of the latter by means of a kinematic chain comprising flexible transmission means.

In this embodiment, the rotation shaft of the brush and the drive shaft are connected by means of an arm able to  
25 selectively rotate in a controlled fashion around said drive shaft to achieve the aforesaid movement of revolution.

Thus we shall have, when the oscillating arm is inclined downwards, the brush approaches the surface to be cleaned, whereas, when the oscillating arm is inclined upwards, the  
30 brush is distanced from the surface to be cleaned.

In both cases, since the distance between the lower surface of the box-like structure and the surface to be cleaned remains constant, the effectiveness of the suction

means remains always at a defined and constant optimum level.

In the preferential embodiment of the invention, the rotation shaft of the brush has a first end coupled with the flexible transmission means connected to the motor and a second end coupled with an element movable both upwards and downwards inside mating guide means solid with said containing structure, thus allowing the brush to remain constantly parallel to the surface to be cleaned for any operating position whatsoever.

According to a variant, this condition is also ensured by the presence of connection means able to connect both ends of the rotation shaft of the brush to the adjustment means.

#### BRIEF DESCRIPTION OF THE DRAWINGS

These and other characteristics of the invention will become clear from the following description of a preferred form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

Fig. 1 is a partial and schematic side view of a cleaning device according to the invention equipped with a rotary brush;

Fig. 2 is a partial front view of the lower box-like structure of a cleaning device according to the invention;

Fig. 3 is a partial, three-dimensional view of the box-like structure in Fig. 2;

Fig. 4 shows the means to adjust the position of the rotary brush.

#### DETAILED DESCRIPTION OF PREFERENTIAL EMBODIMENT

The attached Figures show a cleaning device 10 according to the invention comprising a lower box-like structure 11 able to contain a brush 12, cylindrical in shape with a horizontal axis, a motor 13 able to make the brush 12 rotate

and an adjustment assembly 14 able to allow variations, as will be explained later in more detail, in the position of the brush 12 with respect to the surface to be cleaned 15.

A steering handle and a suction assembly, not shown in order to simplify the drawings, are able to be coupled at the upper part of the box-like structure 11, whereas two rear wheels 29 and two front wheels 33, able to slide on the surface to be cleaned 15, are able to be coupled at the lower part thereof.

10 In this case, the box-like structure 11 is made in two parts coupled together; a lower part, or bottom, 11a and an upper part, or cover, 11b.

The lower part 11a is provided with an aperture 16, from which the brush 12 is able to partly protrude in order to brush the surface to be cleaned 15, and elements able to hold the motor 13, the adjustment assembly 14 and everything else needed for the cleaning device 10 to function.

The motor 13 is equipped with a shaft 21 onto which a first pulley 17 is keyed, connected by means of a toothed belt 18 to a second pulley 19 solid with the rotation shaft 20 of the brush 12. The adjustment assembly 14 comprises, in its essential parts, an oscillating arm 22, a selector 25, a lever 26 and a rod 27.

The rotation shaft 20 is coupled at a first end to the oscillating arm 22 which is free to rotate, in controlled fashion, around the shaft 21 of the motor 13.

The second end of the rotation shaft 20 is connected to a mobile element 23 able to slide, upwards or downwards, inside a mating guide 24 solid with the box-like structure 11.

In this case, the oscillating arm 22 also acts as a shield for the kinematic chain consisting of the two pulleys 17 and 19 and the toothed belt 18.

The selector 25 comprises a lower part able to be coupled rotatably to a seating 28, an upper part suitably shaped to be gripped by the user to rotate said selector 25 around its vertical axis and a substantially cylindrical intermediate  
5 segment, provided with a helical groove 34.

The lever 26 has its front end 26a coupled with the oscillating arm 22 and the rear end 26b, in this case bent back substantially by 90°, able to be inserted in the helical  
groove 34 of the selector 25.

10 The fulcrum, or pivot, 31 of the lever 26 is provided at a point between the front end 26a and the rear end 26b and is coupled with an extension 30 of the lower part 11b of the box-like structure 11.

The fulcrum 31 is vertically aligned with the pulley 17 so  
15 that the oscillating arm 22 is able to follow the movements of the lever 26 to rotate around the shaft 21 without imbalances of forces being created.

The rod 27, substantially U-shaped, is coupled at a first end to the oscillating arm 22, in this case in a position  
20 vertically aligned with the rotation shaft 20 of the brush 12, and at the opposite end to the mobile element 23.

The function of the rod 27 is to transmit, to the end of the brush 12 coupled to the mobile element 23, the same movements to which the end of the brush 12 coupled to the  
25 pulley 20 is subjected.

According to one characteristic of the invention, the wheels 29 and 33 are solidly coupled with the box-like structure 11 so that the lower part 11a thereof is maintained at a defined and constant distance "d" from the  
30 surface to be cleaned 15, and the position of the brush 12 can be adjusted with respect to said surface 15 without modifying the position of the box-like structure 11.

The adjustment is very simple, quick and precise, and requires the user simply to rotate the selector 25, clockwise to bring the brush 12 nearer the surface to be cleaned 15 and anti-clockwise to distance it therefrom.

5 In fact, by rotating the selector 25 clockwise, the rear end 26b of the lever 26 is drawn upwards by the helical groove 34 and therefore the front end 26a of the lever 26 is taken downwards and with it also the oscillating arm 22, solid therewith.

10 On the contrary, by rotating the selector 25 anti-clockwise, the rear end 26b of the lever 26 is drawn downwards by the helical groove 34 and therefore the front end 26a of the lever 26 is taken upwards and with it also the oscillating arm 22, solid therewith.

15 In other words, as shown schematically in Fig. 1, the longitudinal axis 32 of the oscillating arm 22, that is, the axis passing through the centers of the shafts 20 and 21, can be selectively inclined with respect to the surface to be cleaned 15 between a minimum value wherein the bristles  
20 of the brush 12 (in this position indicated by a line of dashes) push against said surface 15, and a maximum value wherein the bristles of the brush 12 (in this position indicated by a continuous line) merely graze said surface 15 or, in a limit condition, may even not interfere at all  
25 therewith.

The selector 25 can be equipped in its upper part with reference marks or similar which allow the user to know immediately what the position of the brush 12 is with respect to the surface to be cleaned 15.

30 It is obvious that modifications or additions can be made to the invention without departing from the spirit and scope thereof. For example, instead of the U-shaped rod 27 elements of a different shape may be used, provided that



they are suitable to transmit simultaneously to both ends of the brush 12 the movements imparted by the oscillating arm 22. Alternatively, instead of a selector 25 of the type shown, other types of selector can be used, for example with  
5 a linear movement, with a cam or similar. Furthermore, the selectors can also act directly on the oscillating arm 22, instead of through the lever 26. Moreover, the oscillating arm 22 can also be coupled with elastic elements able to move it towards a preferential position or able to act as  
10 shock absorbers. Furthermore, the cleaning device 10 according to the invention can also be equipped with two or more rotary brushes 12 coupled with the same oscillating arm 22 or each one coupled with a respective arm 22.

It is also obvious that, although the description refers  
15 to a specific example, a skilled person shall certainly be able to achieve many other equivalent forms of cleaning devices, all of which shall come within the field and scope of this invention.

## CLAIMS

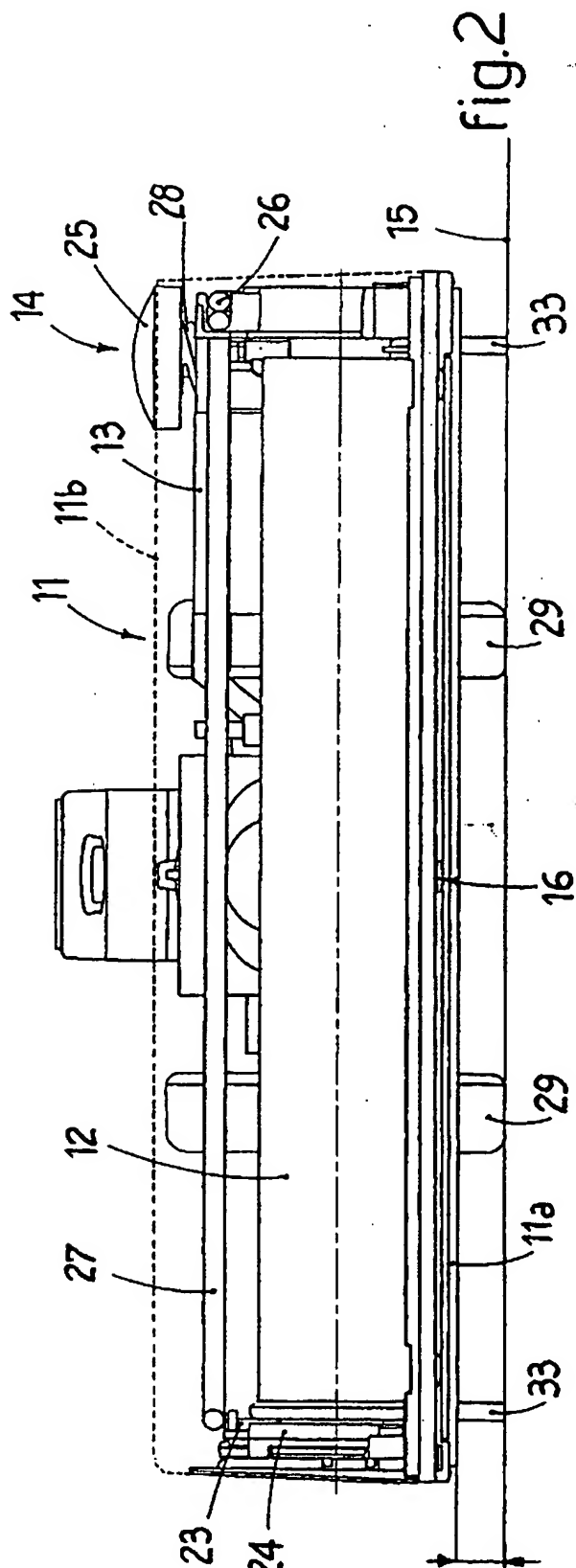
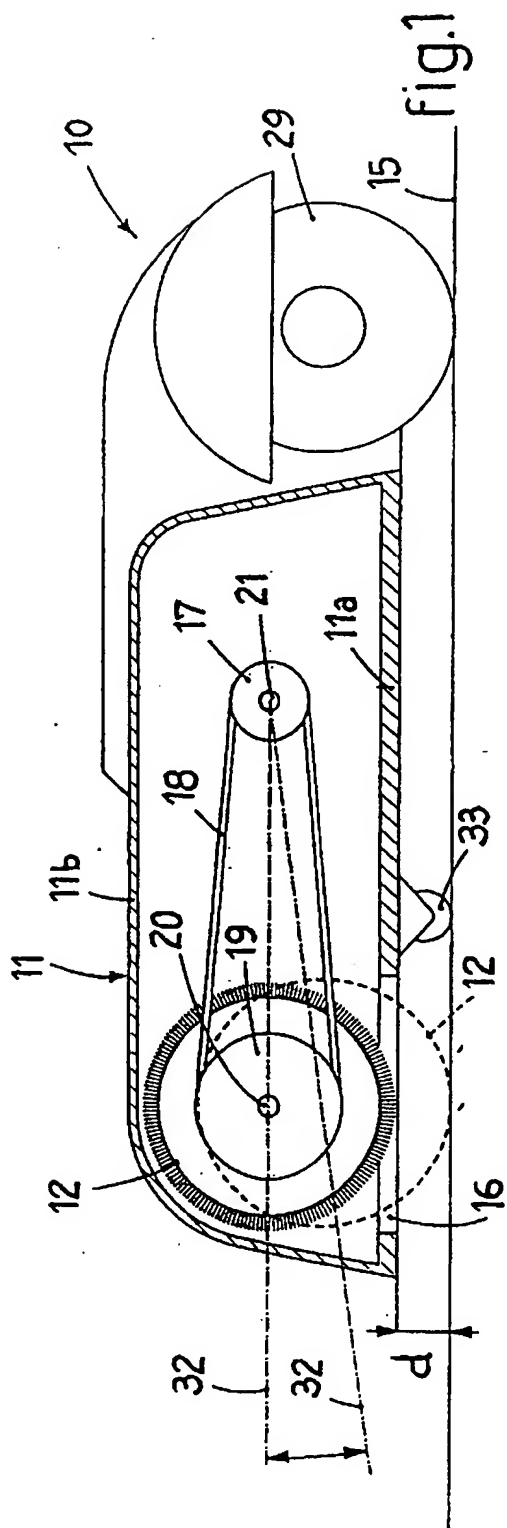
- 1 - Cleaning device comprising a containing structure (11) provided with sliding means (29,33) by means of which it is able to be moved on a surface to be cleaned (15), at least a  
5 brush (12) mounted inside said structure (11) and provided with a substantially horizontal rotation shaft (20) driven by a motor (13) and suction means able to suck the dust and dirt removed by said brush (12), the device being characterized in that said sliding means (29,33) are able to  
10 maintain said box-like structure (11) at a defined distance (d) from said surface to be cleaned (15) and that adjustment means (14) are provided to vary the position of said brush (12) with respect to said box-like structure (11) and, consequently, the distance of said brush (12) from said  
15 surface to be cleaned (15).
- 2 - Cleaning device as in Claim 1, characterized in that said adjustment means (14) are able to selectively move said brush (12) upwards or downwards with a movement of revolution around a defined horizontal axis of said  
20 structure (11).
- 3 - Cleaning device as in Claim 1 or 2, characterized in that said rotation shaft (20) of said brush (12) is coupled at a first end to a pulley (19) connected by means of flexible means (18) to a pulley (17) keyed onto the shaft  
25 (21) of said motor (13) and that said adjustment means (14) comprise an oscillating arm (22) able to connect said rotation shaft (20) to said drive shaft (21) and to selectively rotate around said drive shaft (21) downwards to bring said brush (12) nearer said surface to be cleaned (15)  
30 and upwards to distance said brush (12) from said surface to be cleaned (15), said rotation movements being determined by command means available to the user.

- 4 - Cleaning device as in Claim 3, characterized in that said adjustment means (14) comprise a lever (26) coupled at a first end (26a) to said oscillating arm (22) and at a second end (26b) to said command means, said lever (26) having its fulcrum (31) at a point between said first and second end and said command means being able to selectively lower and raise said second end (26b) to incline said oscillating arm (22) upwards and, respectively, downwards.
- 5 - Cleaning device as in Claim 4, characterized in that said command means comprise a selector element (25) able to rotate on itself, in both directions, around a substantially vertical axis, said selector element (25) being equipped with a substantially cylindrical segment provided with a helical groove (34) inside which said second end (26b) of said lever (26) is able to be inserted in sliding fashion.
- 6 - Cleaning device as in Claim 3, characterized in that said rotation shaft (20) of said brush (12) has the second end, that is, the end opposite the first end where said pulley (19) is keyed, coupled with an element (23) able to slide upwards and downwards inside mating guide means (24) solid with said containing structure (11).
- 7 - Cleaning device as in Claim 6, characterized in that connection means (27) are provided to connect said oscillating arm (22) to said element (23) to maintain said rotation shaft (20) horizontal.
- 8 - Cleaning device as in Claim 7, characterized in that said oscillating arm (22) has a shape able to at least partly surround said pulleys (17, 19) and said flexible means (18), to function as a shield.
- 9 - Cleaning device as in Claim 5, characterized in that said selector element (25) comprises an upper part, of a shape able to be gripped by the user, provided with

reference marks able to facilitate the positioning of said brush (12) with respect to said surface to be cleaned (15).

10 - Cleaning device as in Claim 1, characterized in that said adjustment means (14) are able to permit micro-  
5 movements downwards of said brush (12) according to the level of wear of its bristles.

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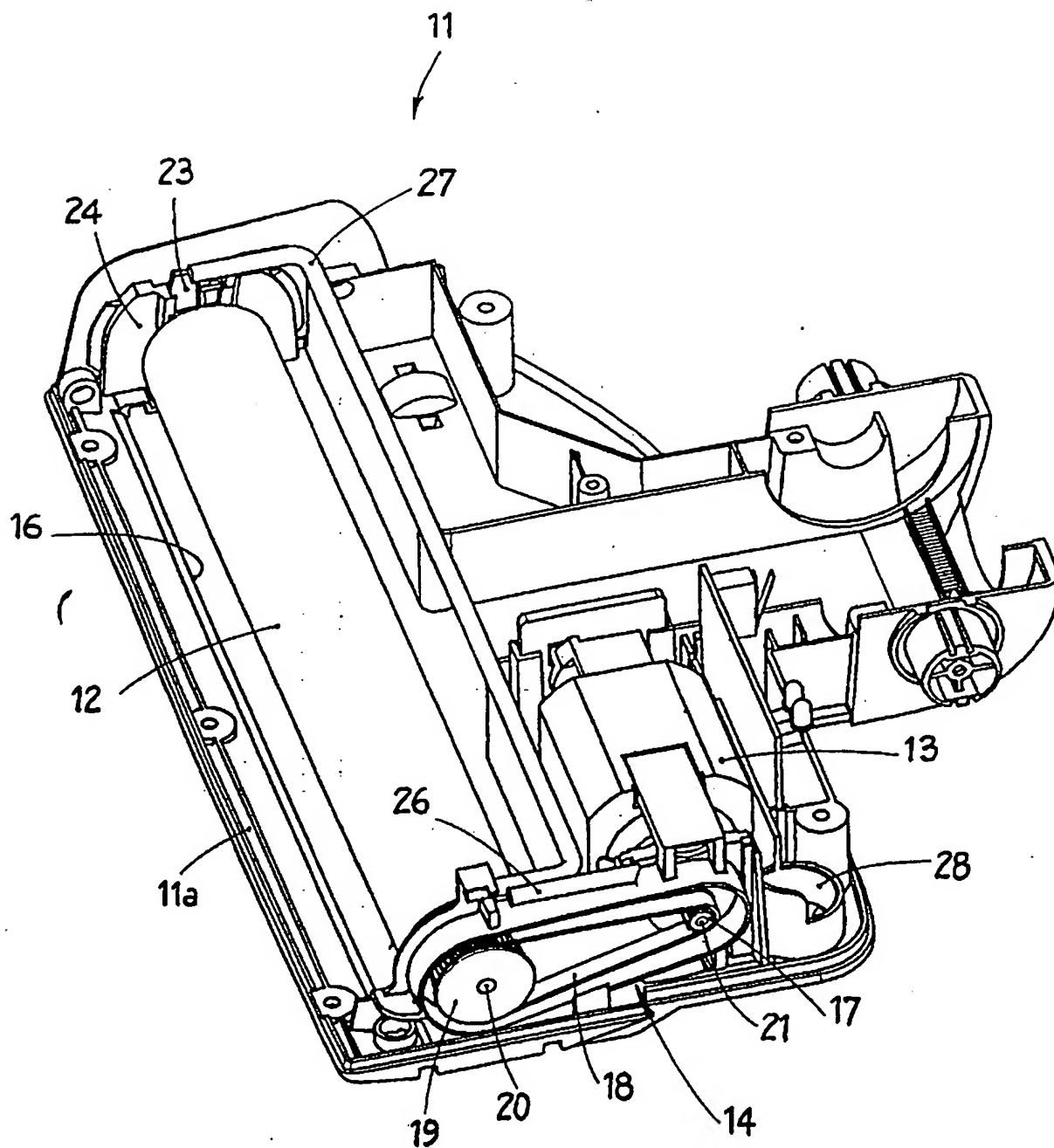


Fig.3

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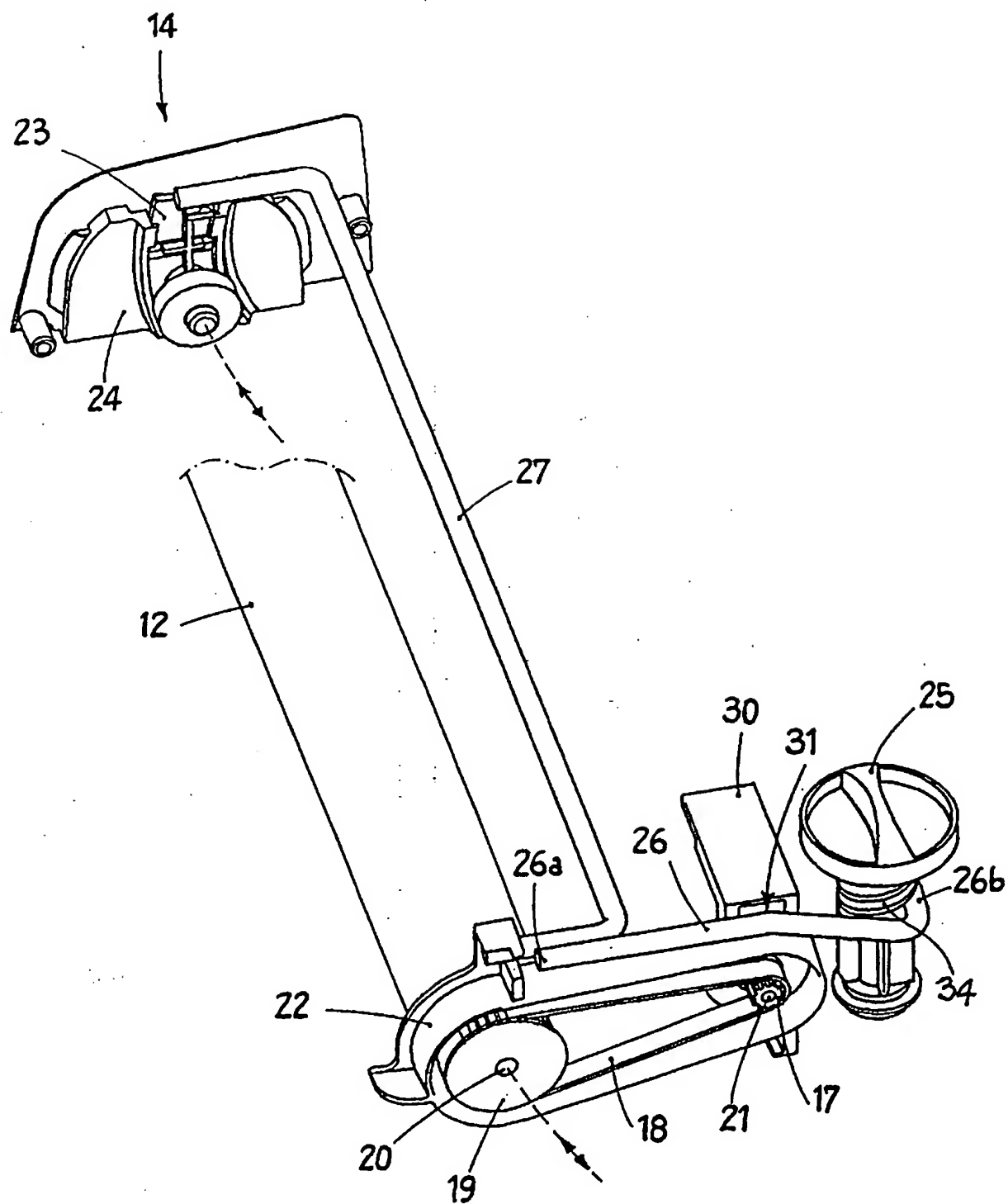


fig.4

# INTERNATIONAL SEARCH REPORT

Int. lional Application No

PCT/IB 00/01791

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 A47L5/34 A47L9/04

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

7 March 2001

Date of mailing of the international search report

14/03/2001

Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 00/01791

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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